REMARKS

Claims 1-6 and 9-10 stand rejected under 35 U.S.C. 103(a) as being obvious over Hayashi et al. (U.S. Patent No. 6,490,139) in view of Taniyama et al. (U.S. Patent No. 5,897,969). In response, Applicants have amended claims 1 and 9-10 to clarify that the copper oxide layer causes specular reflection on, without applying a bias magnetic field to, an interface between the copper oxide layer and the free magnetic layer when the copper oxide layer is formed directly on the free magnetic layer, and an interface between the free magnetic layer and the oxide layer as well as the interface between the oxide layer and the copper oxide layer when the copper oxide layer is formed on the free magnetic layer via the oxide layer, and respectfully traverse.

Hayashi is directed to a magneto-resistive element and magnetic head for data writing/reading. According to the Examiner, Hayashi describes the nickel oxide as being directly formed on the free magnetic layer, and applies a bias magnetic field to the free magnetic layer, unlike the present invention.

Taniyama is directed to a method of manufacturing an MR thin-film head. According to the Examiner, the Taniyama reference discloses that NiO and CuO are equivalent for use as a magnetic domain controlling film in a magnetic head. However, the copper oxide layer of the present invention does not apply a bias magnetic field, as now recited in amended claims 1 and 9-10.

If the copper oxide layer of the present invention applied a bias magnetic field, then when the copper oxide layer is included in the magnetoresistive film and its thickness is

increased, the free magnetic layer's coercive force Hc increases and its coupling field Hin decreases (or increases). However, as illustrated in FIGs. 10 and 11 of the present invention, as a result of increasing the copper oxide layer thickness from zero, the coupling field Hin decreases from (+) to (-), whereas Hc decreases, but then starts increasing in mid course. If a constant bias magnetic field exists in the interface, Hc must be saturated at a certain thickness of the copper oxide layer. However, FIGs. 10 and 11 show this is not true in the present invention. In addition, if the bias magnetic field decreases and starts increasing in mid course along the change of the copper oxide layer's thickness and Hc is as described above, Hin should also decrease and then start increasing in mid course. Therefore, even if (1) a constant bias magnetic field or (2) a bias magnetic field that changes as the thickness of the copper oxide layer changes exists between the copper oxide layer and the free magnetic layer, the changes of Hc and Hin of the present invention cannot be explained. For these reasons, Applicants submit that the data shown in FIGs. 10 and 11 of the present invention illustrate that the copper oxide layer of the present invention does not apply a bias magnetic field.

In addition, the present invention has a feature that the copper oxide layer causes specular reflection on an interface between the copper oxide layer and the free magnetic layer when directly formed on the free magnetic layer, or on the interface between the free magnetic layer and the oxide layer as well as on the interface between the oxide layer and the copper oxide layer when formed on the free magnetic layer via the oxide layer. The copper oxide layer does not control the magnetic domain of the free magnetic layer. In the present invention, Hin changes due to the copper oxide layer being included. However, Hin

is an exchange coupling field applied by the pinned magnetic layer, and is not a bias magnetic field applied by the copper oxide layer.

Since the cited references do not disclose or suggest, among other things, a copper oxide layer that causes specular reflection on, without applying a bias magnetic field to, an interface between the copper oxide layer and the free magnetic layer when the copper oxide layer is formed directly on the free magnetic layer, and an interface between the free magnetic layer and the oxide layer and on the interface between the oxide layer and the copper oxide layer when the copper oxide layer is formed on the free magnetic layer via the oxide layer, withdrawal of the §103 rejection to claims 1-6 and 9-10 is respectfully requested.

Claim 7 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi, in view of Taniyama, and further in view of Kawawake et al. (U.S. Patent No. 6,245,450). Since claim 7 depends upon claim 1, it necessarily includes all of the features of independent claim 1 plus additional features. Thus, Applicants submit that the §103 rejection of claim 7 has also been overcome for the same reasons mentioned above to overcome the rejection of independent claim 1. Applicants respectfully request that the §103 rejection of claim 7 also be withdrawn.

For all of the foregoing reasons, Applicants submit that this Application is in condition for allowance, which is respectfully requested. The Examiner is invited to contact the undersigned attorney if an interview would expedite prosecution.

Respectfully submitted,

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